

## Complete Summary

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### GUIDELINE TITLE

Chemical inhalants/carbon monoxide inhalation.

### BIBLIOGRAPHIC SOURCE(S)

Chemical inhalants/carbon monoxide inhalation. Philadelphia (PA): Intracorp; 2004. Various p.

### GUIDELINE STATUS

This is the current release of the guideline.

All Intracorp guidelines are reviewed annually and updated as necessary, but no less frequently than every 2 years. This guideline is effective from January 1, 2004 to January 1, 2006.

## COMPLETE SUMMARY CONTENT

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## SCOPE

### DISEASE/CONDITION(S)

Carbon monoxide poisoning

### GUIDELINE CATEGORY

Diagnosis  
Evaluation  
Management  
Treatment

### CLINICAL SPECIALTY

Critical Care  
Emergency Medicine  
Family Practice  
Internal Medicine  
Pulmonary Medicine

#### INTENDED USERS

Allied Health Personnel  
Health Care Providers  
Health Plans  
Hospitals  
Managed Care Organizations  
Utilization Management

#### GUIDELINE OBJECTIVE(S)

To present recommendations for the diagnosis, treatment, and management of carbon monoxide poisoning that will assist medical management leaders to make appropriate benefit coverage determinations

#### TARGET POPULATION

Individuals with carbon monoxide poisoning

#### INTERVENTIONS AND PRACTICES CONSIDERED

##### Diagnosis/Evaluation

1. Physical examination and assessment of signs and symptoms
2. Diagnostic tests
  - Respiratory analysis
  - Hematology lab results
  - Arterial blood gases and pulse oximetry cannot be used

##### Treatment/Management

1. Oxygen treatments with high-flow reservoir face mask
2. Intubation and respiratory support with administration of high flow oxygen
3. Cardiac support and monitoring
4. Delivery of oxygen in a mono-chamber or multiplace hyperbaric oxygen chamber

#### MAJOR OUTCOMES CONSIDERED

Not stated

## METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)  
Hand-searches of Published Literature (Secondary Sources)  
Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Searches were performed of the following resources: reviews by independent medical technology assessment vendors (such as the Cochrane Library, HAYES); PubMed; MD Consult; the Centers for Disease Control and Prevention (CDC); the U.S. Food and Drug Administration (FDA); professional society position statements and recommended guidelines; peer reviewed medical and technology publications and journals; medical journals by specialty; National Library of Medicine; Agency for Healthcare Research and Quality; Centers for Medicare and Medicaid Services; and Federal and State Jurisdictional mandates.

#### NUMBER OF SOURCE DOCUMENTS

Not stated

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

#### METHODS USED TO ANALYZE THE EVIDENCE

Review

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

#### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

#### DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

A draft Clinical Resource Tool (CRT or guideline) is prepared by a primary researcher and presented to the Medical Technology Assessment Committee.

The Medical Technology Assessment Committee is the governing body for the assessment of emerging and evolving technology. The Committee is comprised of a Medical Technology Assessment Medical Director, the Benefit and Coverage

Medical Director, CIGNA Pharmacy, physicians from across the enterprise, the Clinical Resource Unit staff, Legal Department, Operations, and Quality.

Revisions are suggested and considered. A vote is taken for acceptance or denial of the CRT.

#### RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

#### COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

#### METHOD OF GUIDELINE VALIDATION

Comparison with Guidelines from Other Groups  
Internal Peer Review

#### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

### RECOMMENDATIONS

#### MAJOR RECOMMENDATIONS

##### Diagnostic Confirmation

##### Subjective Findings

- Headache (most common symptom)
- Dizziness
- Nausea
- Change in consciousness

##### Objective Findings

- Disorientation, dilated pupils
- Sensorineural hearing loss
- Seizure activity
- Lab hematology results: carboxyhemoglobin level greater than 10% in the blood
- Respiratory analysis: carbon monoxide breath concentration greater than 6 parts per million (ppm)
- Metabolic acidosis and/or coma
- Hypotension, cardiac arrest

##### Diagnostic Tests

- Respiratory analysis (co-oximetry levels, carbon monoxide level)
- Hematology lab results
- Arterial blood gases CANNOT be used to diagnose carbon monoxide (CO) overexposure. CO does not affect the amount of oxygen dissolved in the serum; therefore, the PO<sub>2</sub> and oxygen saturation will be normal even in the presence of substantial CO poisoning.
- Pulse oximetry also CANNOT be used; the probe will read the carboxyhemoglobin saturation as oxyhemoglobin and thus produce a false normal reading

### Differential Diagnosis

- Neurologic cause of presenting symptoms
- Cardiac cause of presenting symptoms
- Drug intoxication/overdose
- Acute respiratory or airway distress (e.g., pneumothorax)
- Other pulmonary condition (e.g., chronic obstructive pulmonary disease [COPD], emphysema)

### Treatment Options

- Oxygen treatments with high-flow reservoir face mask
- Intubation and respiratory support, with administration of high flow oxygen
- Cardiac support and monitoring
- Delivery of oxygen in a mono-chamber or multi-place hyperbaric oxygen (HBO) chamber

#### In mild exposures:

- If carboxyhemoglobin level is less than 25%, delivery of oxygen via mask at 100% with respiratory support if needed
- If carboxyhemoglobin level is greater than 25%, hyperbaric oxygen therapy may be needed.

#### In moderate to severe exposures:

- If carboxyhemoglobin level is greater than 40%, a tight-fitting mask (aviator mask, anesthesia mask) or an endotracheal tube is used to deliver 100% O<sub>2</sub>
  - Plastic "rebreather" masks commonly used in emergency rooms rarely deliver oxygen at 50% and should be avoided.
  - Acidosis and arterial pH are corrected to greater than 7.15, and K<sup>+</sup> is supplemented if needed.
- Careful attention must be paid to the patient with severe emphysema or restrictive airway disease as high levels of O<sub>2</sub> may cause respiratory depression and CO<sub>2</sub> buildup.
- Once stable, the treatment is best delivered within an HBO chamber.
  - Pressurized, 100% oxygen can be delivered to the patient at greater than 1.4 times atmospheric pressure, if a mono-place chamber is used (one-person).
  - For multiplace chamber compressed air (pure O<sub>2</sub>) is delivered via a mask, head tent, or endotracheal tube.

- Monoplace chamber: 3 times ambient atmosphere (atm abs) for 30 minutes, then 2.4 times atm abs for 1 hour further. Treatment can be repeated in 2 to 8 hours; if equipped, patients may take air breaks.
- Multiplace chamber: 3 times atm abs is obtained and patient receives 2 to 3 twenty-minute periods of 100% O<sub>2</sub> by mask, head tent, or endotracheal tube; alternating with 5 minute breaks where the patient breathes "room air."

#### Duration of Medical Treatment

- Acute - optimal: 1 day; maximal: 28 days

Additional provider information regarding primary care visit schedules, referral options, and frequency and duration of specialty care is provided in the original guideline document.

The original guideline document also provides a list of red flags that may affect disability duration and return to work goals, including

- Mild exposure, minor symptoms
- Mild to severe exposure, symptoms of carboxyhemoglobin greater than 10%.

#### CLINICAL ALGORITHM(S)

None provided

### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation.

### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

#### POTENTIAL BENEFITS

Appropriate diagnosis, treatment, and management of carbon monoxide poisoning that assist medical management leaders in making appropriate benefit coverage determinations

#### POTENTIAL HARMS

Careful attention must be paid to the patient with severe emphysema or restrictive airway disease as high levels of O<sub>2</sub> may cause respiratory depression and CO<sub>2</sub> buildup.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

### IOM DOMAIN

Effectiveness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Chemical inhalants/carbon monoxide inhalation. Philadelphia (PA): Intracorp; 2004. Various p.

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2004

### GUIDELINE DEVELOPER(S)

Intracorp - Public For Profit Organization

### SOURCE(S) OF FUNDING

Intracorp

### GUIDELINE COMMITTEE

CIGNA Clinical Resources Unit (CRU)  
Medical Technology Assessment Committee (MTAC)

### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Not stated

## FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

## GUIDELINE STATUS

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## GUIDELINE AVAILABILITY

Electronic copies: Intracorp guidelines are available for a licensing fee via a password protected, secure Web site at [www.intracorp.com](http://www.intracorp.com).

## AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Policies and procedures. Medical Technology Assessment Committee Review Process. Philadelphia (PA): Intracorp; 2004. 4 p.

Print copies: Available from Intracorp, 523 Plymouth Road, Plymouth Meeting, PA, 19462; Phone: (610) 834-0160

## PATIENT RESOURCES

None available

## NGC STATUS

This NGC summary was completed by ECRI on November 23, 2004. The information was verified by the guideline developer on December 8, 2004.

## COPYRIGHT STATEMENT

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